

Calculus I, Section 1.1, #36
Four Ways to Represent a Function

Find the domain of the function¹

$$f(u) = \frac{u+1}{1 + \frac{1}{u+1}}$$

We must exclude from the domain of the function any value of u that makes a denominator 0.

The most obvious denominator is $u+1$. To find the value of u that must be excluded, we solve $u+1=0$ to get $u=-1$.

But $1 + \frac{1}{u+1}$ is also a denominator. We solve

$$\begin{aligned} 1 + \frac{1}{u+1} &= 0 \\ 1 \cdot \frac{u+1}{u+1} + \frac{1}{u+1} &= 0 \\ \frac{u+1+1}{u+1} &= 0 \\ \frac{u+2}{u+1} &= 0 \\ \frac{u+2}{u+1} \cdot (u+1) &= 0 \cdot (u+1) \\ u+2 &= 0 \\ u &= -2 \end{aligned}$$

We know that we must exclude $u=-2$ and $u=-1$ from the domain of f . Thus, the domain of f is

$$(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$$

¹Stewart, *Calculus, Early Transcendentals*, p. 21, #36.